

Disaster Risk Management: The Odisha Model

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Abstract

Disaster Risk Management (DRM) has become a vital area of focus in sustainable development strategies, especially in regions frequently exposed to natural hazards. Odisha, an eastern Indian state, has emerged as a pioneer in effective disaster management due to its consistent exposure to cyclones, floods, and droughts. Historically marked by high casualties and infrastructure damage, Odisha's disaster landscape witnessed a transformative shift following the catastrophic Super Cyclone of 1999. Since then, the state has built a dynamic and resilient model of DRM, earning national and global recognition.

The Odisha Model emphasizes preparedness, early warning, rapid response, and recovery, with a strong focus on community participation and inclusivity. It combines institutional mechanisms like the Odisha State Disaster Management Authority (OSDMA) with grassroots volunteer networks to ensure swift and efficient management of disasters. Technological tools such as Geographic Information Systems (GIS), satellite imagery, and mobile-based alert systems are integrated to enhance decision-making and communication.

This paper explores the core components of Odisha's DRM framework, assessing its structure, implementation, and impact. Special attention is given to its community-led initiatives, policies supporting vulnerable populations, and the use of digital innovations. By analyzing Odisha's successes and ongoing challenges, the study contributes to broader DRM discourse and provides replicable insights for other disaster-prone regions.

Keywords: Disaster Risk Management, Odisha Model, Early Warning System, Community-led Preparedness, Inclusive Disaster Management, Technology Integration

1. Introduction

1.1 Background

India's vast geographical expanse and diverse climatic conditions make it one of the most disaster-prone countries in the world. With risks ranging from earthquakes and cyclones to floods and droughts, disaster risk management (DRM) has become a central concern for policymakers and development planners. Among Indian states, Odisha stands out due to its frequent exposure to tropical cyclones, coastal erosion, and heavy rainfall, all of which have historically resulted in severe human and economic losses.

1.2 Significance of Odisha in Disaster Context

Odisha's location along the Bay of Bengal makes it highly susceptible to extreme weather events. The devastating 1999 Super Cyclone, which claimed over 10,000 lives, exposed severe gaps in disaster response and highlighted the need for institutional reforms. In response, Odisha adopted a comprehensive DRM approach that combined state-level planning with community-based implementation. Despite its socio-

economic challenges, including poverty and underdevelopment, the state has significantly improved its disaster resilience in the last two decades.

1.3 Research Gap and Objectives

While there is growing academic and policy interest in DRM in India, focused studies on Odisha's unique model remain limited. Many analyses generalize disaster response frameworks without delving into state-specific strategies. This study seeks to fill this research gap by closely examining Odisha's DRM policies, particularly the Odisha Disaster Management Act and the operational role of OSDMA. The objectives of the study are:

- To review the DRM frameworks in India and specifically in Odisha.
- To assess the effectiveness of Odisha's disaster management strategies.
- To identify gaps and recommend improvements in the existing model.

1.4 Scope and Methodology

The study is confined to the geographical and administrative context of Odisha. It employs a qualitative research methodology, relying on document analysis, case study reviews, and expert interviews. The focus remains on evaluating DRM policy implementation, community engagement, and the role of technology in disaster preparedness and response. Limitations include reliance on secondary data and the specific focus on one Indian state, which may limit broader generalizations.

1.5 Structure of the Paper

This paper is organized into eight chapters. The first chapter introduces the study, outlining its background, significance, and scope. Chapter 2 reviews national and state-level literature on DRM. Chapter 3 analyzes the Odisha Disaster Management Act and institutional framework. Chapter 4 explores community involvement, inclusivity, and technological integration. Chapter 5 presents case studies of successful disaster responses. Chapter 6 identifies challenges and extracts lessons. Chapter 7 concludes the findings and offers policy recommendations. Chapter 8 summarizes the insights and proposes areas for future research.

2. Literature Review

Gunjal, B. (2017), *Managing Knowledge and Scholarly Assets in Academic Libraries: Issues and Challenges*, IGI Global, pp. 270–279. Gunjal explores the strategic role of academic libraries in knowledge management, focusing on digital preservation, metadata, and scholarly communication.

Pattnayak, S. (2015), *Role of Social Capital in Disaster Risk Management: A Theoretical Perspective*, Self-published, pp. 1–12. Pattnayak highlights how trust networks and social norms support community-based disaster resilience.

Mohapatra, S. (2017), *Community-Based Organizations and Their Role in Disaster Risk Reduction and Management in Odisha*, *Journal of Community Development*. Mohapatra discusses how Community-Based Organizations (CBOs) utilize local knowledge and participatory methods to manage disaster vulnerabilities.

Ashok, J. (2019), *Analysis of the Odisha Disaster Management Act and Policy*, *Journal of Disaster Management*, pp. 1–20. Ashok critiques Odisha's legal framework for disaster governance, pointing out coordination gaps and the need for reforms.

Das, S. (2020), *Effectiveness of the Odisha Disaster Management Policy in Reducing Disaster Risk*, *Journal of Disaster Research*, pp. 1–18. Das presents evidence of improved early warning systems and community participation, with scope for policy refinement.

- Gaffar, A. (2016), Access and Usage of E-Journals by Research Scholars in NIT Rourkela, *Journal of Indian Library Association*, pp. 1–12. Gaffar analyzes scholars' reliance on e-resources, noting limitations in access infrastructure and user training.
- Tripathi, D. P. (2017), Open Source Solutions for Creation of ETD Archives, 62nd ILA Conference, pp. 1–10. Tripathi demonstrates the implementation of open-source repositories for digital thesis preservation.
- Behera, S. K. (2017), Enhancing Library Services through Subject Guide, *Librarianship in New Millennium*, pp. 73–84. Behera shows how subject guides improve user engagement and research accessibility in academic libraries.
- Gaitanou, P. (2017), Research Data Management: A Proposed Framework, *IASSIST Quarterly*, pp. 1–12. Gaitanou proposes a data lifecycle framework to streamline research data handling in educational institutes.
- Yasin, S. (2012), Social Networks and Knowledge Management, *Knowledge Management*, pp. 1–10. Yasin investigates the use of social networks for improved knowledge sharing in libraries.
- Shi, H. (2008), Australian Digital Libraries: An Overview, *WCECS*, pp. 1–10. Shi provides a global perspective on how Australian libraries use digital platforms to promote open access.
- Urs, S. R. (2006), Knowledge Organisation Systems in Digital Libraries, *Information Studies*, pp. 229–257. Urs highlights the importance of metadata and interoperability in digital libraries.
- Koganurmuth, M. M. (2003), Database System: Concepts and Design, *KM in Special Libraries*, pp. 1–10. Koganurmuth examines database system design for better service delivery in special libraries.
- Buck, S. (2007), Ontologies in Portal Design, *Encyclopedia of Portal Technologies*, pp. 653–657. Buck discusses the use of ontologies to enhance digital portal usability and search functions.
- Das, A. K. (2019), Personalized Service for Library Users through Subject Guide, *Next Generation Libraries*, pp. 1–10. Das highlights subject guides as tools for personalized services and improved user satisfaction.
- Gaffar, S. K. A. (2019), Mobile Applications in Libraries, *Emerging Trends for SMART Library*, pp. 1–10. Gaffar studies mobile app use in libraries, noting growing usage despite digital literacy challenges.
- Rath, P. K. (2020), Gamification and Its Implications in Academic Libraries, *Int. Journal of Information Dissemination*, pp. 1–10. Rath explores gamification to boost user engagement and library service interaction.
- Behera, S. K. (2018), Role of Library and Information Centers in Disaster Management, *Journal of Disaster Management*, pp. 1–12. Behera describes libraries as critical sources of disaster-related information during emergencies.
- Ashok, J. (2020), Disaster Risk Reduction and Management in Odisha, *Journal of Disaster Research*, pp. 1–20. Ashok evaluates institutional coordination in DRR, identifying gaps in grassroots implementation.
- NDMA (2009), National Policy on Disaster Management, Government of India. NDMA defines India's strategic DRR framework, emphasizing coordination and capacity building.
- Meher, A. (2024), The Framework for Adaptive Governance in Odisha, *Educational Administration: Theory and Practice*, pp. 377–388. Meher proposes adaptive governance to tackle climate and disaster challenges through institutional coordination.
- Panda, G. K. (2015), Assessment of Human Vulnerability to Floods in Odisha, *Springer*, pp. 325–340. Panda uses statistical methods to map flood vulnerability and aid mitigation planning.
- Swain, S. et al. (2019), Vulnerability and Adaptation to Extreme Heat in Odisha, *IJERPH*. Swain compares community adaptation methods to heatwaves, highlighting traditional resilience.
- Nanda, P. & Ghosh, S. (2017), Adaptation Strategies in Coastal Odisha, *Journal of Coastal Agricultural Research*, Vol. 35(1). Nanda and Ghosh document various agricultural and structural adaptations employed in coastal Odisha to manage climate-induced disasters.

Mohapatra, S. (2024), The 'Odisha Model' for Disaster Resilience, NCAER. Mohapatra explains how Odisha has become a model for disaster risk reduction through proactive policies, institutional preparedness, and community involvement.

Hiware, K. et al. (2020), NARMADA: Disaster Resource Management Platform, arXiv. Hiware and colleagues introduce an AI-powered platform that facilitates disaster relief coordination using data from social media.

Tripathy, S. S. et al. (2020), Flood Evacuation During Pandemic: A Multi-Objective Framework, arXiv. Tripathy and team propose an integrated response system for managing overlapping crises like floods and pandemics, emphasizing adaptability and coordination

This literature review integrates studies spanning disaster risk management, community-based adaptation, digital library systems, and knowledge management. It provides a comprehensive understanding of how institutional frameworks, technological innovations, and community initiatives can jointly address complex challenges such as climate change, natural disasters, and digital information handling. The synthesis of these diverse studies reveals the growing importance of localized governance, participatory approaches, and advanced technologies in fostering resilience and access to knowledge.

3. Methodology

This chapter describes the methodology adopted to examine the Odisha model of disaster risk management. A mixed-methods approach was used, combining qualitative and quantitative techniques to offer a thorough understanding of Odisha's disaster management policies, systems, and community engagement.

3.1 Research Design and Approach

The research was conducted as a case study focused on the Odisha model of disaster risk management. Case studies are particularly useful for exploring complex systems within their real-world context. This method allowed for a deep analysis of Odisha's disaster risk management, integrating both qualitative insights and quantitative data. By merging these approaches, the study enhanced the reliability and depth of its findings, ensuring that data from different sources corroborated each other, strengthening the overall validity of the research.

3.2 Data Collection Methods

Data for the study was gathered from both primary and secondary sources, offering a well-rounded perspective on Odisha's disaster management efforts.

Primary Data Sources:

1. *Semi-structured Interviews*: Twenty individuals, including state officials, policy designers, and disaster management professionals, were interviewed. These interviews provided insights into the development and challenges of disaster management strategies.
2. *Focus Group Discussions (FGDs)*: FGDs were held with 30 residents, including village heads and community members. These discussions provided valuable feedback on local disaster preparedness, community responses, and the effectiveness of interventions at the grassroots level.
3. *Observational Studies*: Observations were made during ten disaster preparedness activities, such as mock drills, training programs, and awareness campaigns. These observations offered direct insight into how strategies were applied on the ground.

Secondary Data Sources:

1. *Government Documentation*: Key documents like policies, state action plans, and post-disaster reports were analyzed to understand the legislative and institutional framework of disaster management in Odisha.

2. *Academic Literature*: A review of previous studies, peer-reviewed articles, and global comparisons was conducted to contextualize Odisha's approach within the wider field of disaster risk management.
3. *Media Coverage*: News reports were examined to gauge public perception, media accountability, and the portrayal of disaster events, contributing to an understanding of Odisha's disaster response.

3.3 Sampling Strategy and Sample Size

A purposive sampling strategy was employed to select individuals with specialized knowledge relevant to Odisha's disaster risk management. The sample included:

- » 20 state-level officials and disaster management experts
- » 30 local community members and leaders
- » 10 observed disaster preparedness activities

This targeted approach ensured a comprehensive understanding of both policy-makers' perspectives and community-level engagement in disaster management.

3.4 Data Analysis Techniques

The data were analyzed using a combination of qualitative and quantitative techniques to ensure a nuanced interpretation of the findings.

1. **Thematic Analysis**: Data from interviews and FGDs were analyzed to identify recurring themes related to policy effectiveness, institutional coordination, and community resilience.
2. **Content Analysis**: Official documents, media articles, and academic studies were reviewed to track policy developments, identify challenges, and compare Odisha's practices with broader national and global disaster management standards.
3. **Statistical Analysis**: Quantitative data, such as disaster frequency, response times, and casualty figures, were analyzed using descriptive statistics to identify trends and assess the effectiveness of Odisha's interventions.

3.5 Ethical Considerations

Ethical guidelines were strictly followed throughout the research to ensure participant protection and data integrity.

1. **Informed Consent**: Participants were fully informed about the purpose of the study, with consent obtained before participation.
2. **Confidentiality**: Participant identities were kept confidential, and all collected data were securely stored and used solely for academic purposes.
3. **Minimizing Harm**: Efforts were made to ensure that participants did not experience physical or psychological distress during the study.

By adhering to these ethical standards, the study aimed to produce reliable, meaningful insights into the Odisha model of disaster risk management

4. Odisha's Disaster Risk Management Framework

Odisha, located on India's eastern coastline, frequently experiences natural disasters, particularly cyclones and floods. In response, the state has developed a comprehensive disaster risk management framework, which has become a model for other regions. This chapter examines the role of the Odisha State Disaster

Management Authority (OSDMA), key disaster management policies, technological innovations, and community involvement that form the foundation of Odisha's resilience strategy.

4.1 Role and Structure of OSDMA

OSDMA was established after the 1999 Super Cyclone to improve the state's ability to manage natural disasters. It serves as the coordinating body for disaster preparedness, mitigation, and response efforts. OSDMA collaborates with state departments, local governments, and national and international partners to create a cohesive disaster risk reduction (DRR) system.

OSDMA is responsible for conducting risk assessments, planning evacuation drills, organizing training programs, and facilitating communication between various levels of government. Its role in integrating disaster preparedness into broader development planning is critical for building long-term resilience.

4.2 Disaster Management Policies and Planning

Odisha's disaster management policies emphasize proactive risk reduction. The state's primary objective is to achieve a "zero casualty" goal during disasters, minimizing human loss through comprehensive planning. This approach involves hazard mapping, strengthening infrastructure, and using scientific data to inform decision-making.

In collaboration with the Regional Integrated Multi-Hazard Early Warning System (RIMES), Odisha has implemented advanced forecasting methods for various hazards, including lightning, heatwaves, and droughts. These initiatives contribute to more accurate and timely disaster responses by improving the scientific foundation of disaster risk planning.

4.3 Early Warning Systems and Emergency Response Mechanisms

A key element of Odisha's disaster preparedness is its effective early warning system. The system includes mobile alerts, sirens, public announcement systems, and alert towers in vulnerable coastal zones. These technologies ensure that even remote communities receive timely warnings, allowing them to evacuate or take protective measures in advance of disasters.

The Odisha Disaster Rapid Action Force (ODRAF) is the state's specialized team for disaster response. ODRAF is equipped with modern tools and communication devices, enabling rapid mobilization and efficient rescue operations. Additionally, Odisha's well-coordinated relief efforts ensure that food, water, shelter, and healthcare are promptly provided to affected areas.

4.4 Community Engagement and Local Participation

Odisha's disaster risk management model stands out for its strong emphasis on community involvement. Local residents are not merely recipients of disaster preparedness programs; they actively contribute to the process. Community-Based Organizations (CBOs) and trained volunteers assist with the dissemination of early warnings, evacuation planning, and the management of relief efforts during emergencies.

The state also invests heavily in capacity-building at the grassroots level. Regular training, mock drills, and public awareness campaigns empower local communities to take an active role in disaster preparedness and response. This inclusive approach strengthens community resilience and enhances trust in government interventions.

Odisha's disaster risk management framework exemplifies a coordinated, multi-dimensional approach that integrates institutional expertise, technological innovations, and community participation. The establishment of OSDMA, the implementation of sophisticated early warning systems, and the training of specialized response teams have significantly strengthened the state's disaster management capacity. The active involvement of local communities in disaster preparedness efforts further enhances Odisha's resilience.

By combining strategic planning and inclusive governance, Odisha has transformed itself from a vulnerable region into a model of disaster risk management.

5. Integrating Technology in Odisha's Disaster Risk Management

Odisha, situated along India's eastern coast, frequently faces natural calamities like cyclones, floods, and storms. This high vulnerability has led the state to incorporate technology as a central pillar in its disaster risk management (DRM) framework. Over time, Odisha has developed a diverse range of technological solutions to enhance disaster preparedness, response, and recovery. This chapter outlines the key technologies utilized, their advantages and drawbacks, and successful case studies while exploring future directions for technological advancement in the state's disaster management efforts.

5.1 Key Technologies in Use

Odisha's disaster management approach is deeply reliant on digital and remote-sensing technologies, which facilitate real-time monitoring and faster decision-making during emergencies. The main technologies integrated into the DRM system include:

- » **Satellite Imaging:** This is used to monitor climatic changes, coastline shifts, and flood-prone regions. It enables early detection of threats and supports strategic planning and risk mapping.
- » **Mobile Applications:** Customized mobile apps offer timely alerts and safety guidelines. These apps are user-friendly, especially for semi-literate and rural populations, ensuring critical information is accessible to all.
- » **Digital Mobile Radios (DMR):** These radios allow uninterrupted communication among disaster response teams when cellular networks are disrupted by extreme weather events.
- » **Satellite Communication Terminals:** These tools maintain connectivity during emergencies, supporting coordination across agencies even when terrestrial networks are down.
- » **Early Warning Dissemination Systems (EWDS):** This system uses multiple communication channels—such as sirens, SMS, public address systems, and LED displays—to reach communities with warnings effectively and efficiently.

5.2 Advantages and Limitations

Benefits:

1. **Improved Preparedness:** Early warning systems enable authorities and residents to act before disasters strike, significantly reducing loss of life and damage to property.
2. **Efficient Response:** With better communication through mobile and radio networks, emergency teams can respond faster and with better coordination.
3. **Community Involvement:** Through accessible platforms like mobile apps and public broadcasting, citizens can stay informed and take appropriate action, empowering communities during crises.

Challenges:

1. **Infrastructure Deficiencies:** In some tribal and remote regions, poor telecommunications and unreliable electricity supply hinder the effectiveness of tech-based solutions.
2. **Managing Big Data:** The growing use of digital platforms produces vast amounts of information. Efficient storage, analysis, and cybersecurity measures are still evolving in the state.

3. **Cybersecurity Concerns:** As reliance on technology grows, so do threats of cyberattacks. Ensuring data protection and system integrity is vital for maintaining operational trust and resilience.

5.3 Successful Technological Initiatives

Odisha has implemented several noteworthy projects that demonstrate the potential of tech-led disaster management.

Early Warning Dissemination System (EWDS): Managed by the Odisha State Disaster Management Authority (OSDMA), this system has proven crucial during cyclones by alerting at-risk populations well in advance. Its use of diverse communication tools ensures comprehensive coverage, even in isolated areas.

Collaboration with RIMES: Through its alliance with the Regional Integrated Multi-Hazard Early Warning System, Odisha has developed area-specific forecasting models. These localized tools help identify regional vulnerabilities and support customized mitigation efforts.

5.4 Looking Ahead: Opportunities for Growth

Odisha's experience with integrating technology into disaster management offers valuable lessons for other disaster-prone regions. To build on its progress, the state should focus on:

Infrastructure Upgrades: Strengthening telecom and power systems, particularly in underserved areas, will extend the reach of DRM technologies and ensure consistent performance during emergencies.

Skill Development: Training programs for officials, first responders, and citizens can improve the use of technology during crises. Familiarity with these tools ensures timely and effective action.

Strategic Partnerships: Collaborating with tech firms, academic institutions, NGOs, and international bodies can facilitate access to advanced solutions, technical expertise, and sustained funding for disaster resilience.

Odisha's approach to disaster management, driven by the integration of advanced technologies, has led to significant improvements in response time, coordination, and public safety. From early warnings to post-disaster recovery, digital tools form the backbone of the state's DRM framework. While challenges related to infrastructure, data management, and cybersecurity remain, continuous investment and innovation can further strengthen Odisha's resilience. The state stands as a strong example of how technology and strategic governance can work together to minimize disaster impacts and protect vulnerable communities.

6. Community-Based Disaster Management in Odisha - A Comprehensive Analysis

Odisha, a coastal state in eastern India, has long been susceptible to natural disasters such as cyclones, floods, and droughts. The state's vulnerability was starkly highlighted by the devastating Super Cyclone of 1999, which led to significant loss of life and property. In response, Odisha pioneered a community-centered approach to disaster risk management (DRM), integrating local knowledge, institutional reforms, and inclusive policies to build resilience.

6.1 Role of Community-Based Organizations (CBOs)

Community-Based Organizations (CBOs) have been instrumental in Odisha's DRM framework. These organizations, often rooted in local traditions and networks, serve as the first line of defense during disasters. They engage in identifying local risks, developing community disaster plans, and conducting mock drills. Their decentralized operations enable rapid response, particularly in remote or high-risk areas. The trust established by CBOs within communities enhances the effectiveness of communication and collective action during emergencies.

6.2 Inclusive Disaster Risk Management Initiatives

Recognizing the disproportionate impact of disasters on marginalized groups, Odisha has implemented inclusive DRM initiatives. Policies and programs have been designed to involve women, persons with disabilities (PwDs), senior citizens, and Scheduled Castes and Scheduled Tribes in all phases of disaster management. Gender-responsive training initiatives promote the active involvement of women in leadership and planning. The Odisha State Disaster Management Authority (OSDMA) has developed modules focused on disability inclusion, enabling PwDs to participate in preparedness drills and evacuation procedures. Additionally, initiatives to include Scheduled Castes and Scheduled Tribes in planning processes have led to more culturally aware and community-rooted responses.

6.3 Community-Led Success Stories

Several initiatives highlight the success of Odisha's community-based approach. The Community-Based Cyclone Preparedness Programme (CBCPP) stands out for training local volunteers in coastal districts like Jagatsinghpur and Ganjam. These trained individuals played a crucial role in minimizing casualties during Cyclone Fani in 2019. Another notable project is the Disaster-Resilient Habitat Programme in Gajapati district, which focused on reconstructing homes using climate-resilient materials and encouraging local ownership of the rebuilding process. These examples demonstrate the effectiveness of engaging communities in long-term resilience efforts.

6.4 Ongoing Challenges and Future Opportunities

Despite these achievements, several challenges continue to affect inclusive DRM in Odisha. Limited funding for grassroots initiatives, a shortage of training opportunities, and gaps in continuous engagement with vulnerable populations remain significant concerns. In particular, women and minority groups still face obstacles in taking up leadership roles in disaster management. To address these issues, Odisha must enhance coordination between CBOs and government agencies, invest in capacity development, and include community feedback in policy-making. There is also potential in using digital tools like mobile applications and GIS mapping to increase access and participation.

7. Challenges and Lessons Learned

7.1 Ongoing Challenges in Implementing DRM

While Odisha has developed a comprehensive institutional framework for disaster risk management, several persistent issues affect the sustainability and scalability of its efforts:

- **Financial Limitations:** Insufficient funding often delays or restricts critical infrastructure projects, including resilient housing and cyclone shelters.
- **Shortage of Skilled Personnel:** A gap in the availability of trained professionals, particularly in rural and remote areas, limits effective implementation at the grassroots level.
- **Inadequate Data Infrastructure:** Reliable, real-time data systems and access to location-specific risk assessments are still evolving, hampering accurate forecasting and emergency response.
- **Inclusion Challenges:** Despite inclusive policies, the actual integration of marginalized communities is sometimes inconsistent due to social and institutional barriers.

7.2 Key Lessons from Odisha's Experience

Odisha's DRM practices have produced valuable insights that can inform other regions:

- **Preparedness Reduces Risk:** Investments in early warning systems, public awareness campaigns, and timely evacuations have significantly decreased disaster-related fatalities. A prominent example is the state's response to Cyclone Phailin in 2013, when mass evacuations were carried out efficiently.

- **Community-Centered Response:** The empowerment of local communities, through volunteer groups and grassroots training, has enhanced emergency response and recovery.
- **Coordinated Institutional Action:** The creation of the Odisha State Disaster Management Authority (OSDMA) has improved coordination among departments, leading to more cohesive disaster responses.
- **Continuous Improvement:** Odisha adopts a learning-based approach with regular evaluations, mock drills, and stakeholder feedback contributing to adaptive DRM policies.

7.3 Applicability in Other Regions

Odisha's DRM framework offers a model for other disaster-prone areas. Its emphasis on strategic planning, institutional collaboration, and community engagement can be tailored to suit different geographic and administrative contexts. Coastal states like Andhra Pradesh or West Bengal may benefit from adopting similar cyclone preparedness strategies. Similarly, states vulnerable to other natural hazards—such as landslides in hilly regions—can adapt Odisha's grassroots, community-driven approach for localized DRM efforts.

8. Conclusion

Odisha's disaster risk management model demonstrates how effective governance, technological innovation, and community participation can collectively strengthen resilience against natural disasters. The state's transformation after the 1999 Super Cyclone highlights the importance of proactive planning, institutional coordination, and inclusive policies in minimizing disaster-related losses. The establishment of OSDMA, the use of advanced early warning systems, and the active involvement of Community-Based Organizations have significantly improved preparedness and emergency response. Despite continuing challenges such as infrastructure gaps, limited funding, and inclusion barriers, Odisha has emerged as a leading example of disaster resilience in India. The study confirms that a people-centered and technology-driven approach is essential for sustainable disaster management. Odisha's experiences and lessons provide valuable insights for other disaster-prone regions seeking to develop adaptive, participatory, and resilient disaster risk management frameworks.

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